User Experience Design

Final Project for Computer Engineering at Politecnico di Torino

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Resumen Español

Inmersos en un mundo digital en el que participan cada vez más personas con diferentes niveles de experiencia en tecnología, ha aparecido la necesidad de diseñar las aplicaciones pensando en el usuario.

El principal problema que un desarrollador se encuentra hoy en día es la falta de tiempo o agilidad para conceder al usuario una experiencia a medida. Muchas empresas han conseguido destacar en un mundo donde la competencia es muy grande gracias al aporte de valor añadido de una buena experiencia de usuario.

Empezando por el análisis psicológico y las reacciones que tenemos cuando estamos interactuando con un sistema digital se intenta conseguir un método para diseñar la experiencia de usuario de un modo satisfactorio para ambas partes.

Con el objetivo de probar el método diseñado, en el cual se incorporan muchas técnicas de otros métodos, se diseña parte de la experiencia de usuario de “ESEM 2014”, una de las conferencias informáticas más importantes del norte de Italia.

Los resultados obtenidos en este trabajo son muy favorables, ya que mejoran substancialmente el resultado final y permiten al desarrollador seguir mejorando la aplicación hasta el momento y objetivo deseado.

Abstract English

In a world where more people with different level of expertise is engaging with technology, designing for the user has become one of the main concerns for the developers.

Lack of time or agility are the main problems from the developers' point of view in order to provide a good user experience. One of most important differentiators for companies is the provided experience as the technology and knowledge is highly available for everyone.

The main goal of this project is to compose a method to include experience design in current agile development where short iterations is the main characteristic.

In order to test the designed method, were many parts of other techniques have been included, part of the "ESEM 2014" conference has been designed.

The results achieved with this guidelines has been very positive from both sides of the development, users and developers. Having short iterations allows improvement until the desired experience is achieved.

Contents

1 Introduction and Objectives **6**

2 Background **7**

2.1 Interaction Models 7

2.1.1 Command line interface 7

2.1.2 Menus 7

2.1.3 Natural language 7

2.1.4 Question/answer and query dialog 7

2.1.5 Form-Fills and spreadsheets 7

2.1.6 Windows Interface 8

2.1.7 Three-dimensional interfaces 8

2.2 Human Thinking 9

2.2.1 Sensory memory 9

2.2.2 Short-term memory 9

2.2.3 Long-term memory 9

2.2.4 Reasoning 9

2.2.5 Problem solving 10

2.2.6 Skill acquisition 10

2.2.7 Errors and mental models 10

2.2.8 Emotion 11

3 Key Concepts In Design **12**

3.1 Usability 12

3.2 Functionality 13

3.3 Responsiveness 14

3.4 Convenience 15

3.5 Fail proof 16

3.6 Visibility 17

3.7 Logic 18

3.8 Consistency 19

3.9 Predictable 20

4 Process **21**

4.1 Introduction . . . 21

4.2 Analysis . . . 23

4.2.1 Contextual Inquiry . . . 23

4.2.2 User Research . . . 23

4.2.3 Contextual Analysis . . . 25

4.2.4 Interaction Design Requirements . . . 25

4.3 Design . . . 28

4.3.1 Design Thinking . . . 28

4.3.2 Conceptual Design . . . 28

4.3.3 Design Production . . . 28

4.4 Evaluation . . . 29

5 ESEM 2014 Conference Companion **30**

5.1 Introduction . . . 31

5.2 Main Objectives . . . 32

5.2.1 Attendees . . . 32

5.2.2 Speakers . . . 32

5.2.3 Conference Planners . . . 32

5.3 Analysis . . . 34

5.3.1 Schedule . . . 34

5.3.2 Speaker Information . . . 35

5.3.3 News System . . . 35

5.3.4 Maps . . . 35

5.3.5 Local Information . . . 36

5.4 Requirements . . . 37

5.4.1 Functional Requirements . . . 37

5.4.2 Interaction Requirements . . . 40

5.5 Personas . . . 42

5.5.1 Giorgio . . . 42

5.5.2 Jaqueline . . . 43

5.5.3 Qwaiv 44
5.6 Design Iterations 45
5.6.1 Iteration 1 45
5.6.2 Iteration 2 47
5.6.3 Iteration 3 49
5.6.4 Iteration 4 59
5.6.5 Iteration 5 64

6 Usability tests and results **76**

7 Real World **80**

8 Conclusions **81**

1 Introduction and Objectives

Computers appeared during the first decades of the 20th century as mechanical devices which allowed the calculation of different mathematical operations, providing the input and output of data through physical objects such as levers, punchcards and other materials. The use of this machines was limited to a reduced amount of people who were focused on expanding its features and who had a high knowledge of them.

During the seventies, Personal Computers where introduced in developed countries and nearly everyone could have one at home which permitted different tasks such as word processing, playing or the usage of multimedia applications.

Due to the expansion of electronic devices, many purposes have been found, including communication, shopping, enterprise level applications or tourism planning among many others.

Actually, in contra-position with thirty years ago, professionals' age is not relevant in order to use electronic devices because a high technological knowledge is not needed anymore.

This new paradigm has forced software companies and engineers all around the world to create new interaction models to design a better user experience for their products.

Being User Experience the main topic of this research, the main objectives of this project are:

- Discover methods to analyse and improve User Experience.
- Study final user priority in current software development.
- Analise the psychological factors involved in learning and using software.
- Apply learned knowledge to design an application.
- Establish an iterative method to include user experience in software development.

2 Background

2.1 Interaction Models

2.1.1 Command line interface

The command line, also known as terminal, provides a mean of expressing instructions to the computer directly, using function keys, single characters, abbreviations or whole-word commands. They are flexible and can be combined to apply a number of tools to the same data. Commands should be remembered by the user and it is a barrier for people who have never used it before. This interface is greatly used among high technical people as it provides a way to manipulate files which is impossible through visual meanings, it is also much faster if the computer is remote.

2.1.2 Menus

In a menu-driven interface, the set of options available for the user is displayed on the screen, and it is selected using the mouse or keyboard. Relying on recognition rather than recall is one of the main advantages for the user. However, menu options still need to be meaningful and organized to aid recognition.

2.1.3 Natural language

The ambiguity of natural language makes it very hard for a machine to understand exactly what a person needs. However, systems can be built to understand restricted subsets of a language, which is relatively successful. This is evolving really fast due to smartphones and desktop devices.

2.1.4 Question/answer and query dialog

The user is asked different questions and is led through the interaction step by step. These interfaces are easy to learn and use, but are limited in their functionality and power.

2.1.5 Form-Fills and spreadsheets

Thery are primarily used for data entry but they can also be useful in data retrieval applications. Most form-filling interfaces assist the user during the

interaction, indicating possible errors and data auto-completion. Spreadsheets are a sophisticated variation of form-filling.

2.1.6 Windows Interface

Windows, menus and icons are used to interact and provide all functionality. This is the default interface for most computers today.

2.1.7 Three-dimensional interfaces

Even if the simplest technique is where ordinary windows interface elements are given a 3D appearance, it is hardly used because current technology is limited. More complex environments can be achieved through projectors and physical objects, but the most complex 3D-workspace is virtual reality.

2.2 Human Thinking

2.2.1 Sensory memory

The sensory memories act as buffers for stimuli received through each of the senses. These memories are constantly overwritten by the new information which is coming in. Information is transmitted from the sensory memory to short-term memory only when it attracts attention, discarding those that are not interesting during a specific period of time.

2.2.2 Short-term memory

Short-term memory is used to store the information which is only required in a short period of time. It can be accessed quickly, but it also decays swiftly and has limited capacity.

2.2.3 Long-term memory

Long-term memory has an unlimited capacity, a slow access time and forgetting occurs more slowly or it does not occur at all. Information is stored here from the Short-term memory through rehearsal. There are two types of Long-term memory:

- Episodic: It represents the memory of event and experiences in a serial form.
- Semantic: It is a structured record of facts, concepts and skills that have been acquired from the episodic memory.

2.2.4 Reasoning

Reasoning is the ability of the mind to think and understand things in a logical way in order to draw conclusions or infer something new about the domain of interest. There are different types of reasoning: deductive, inductive and abductive.

- Deductive reasoning derives the logically necessary conclusion from the given premises.
- Inductive reasoning generalizes cases which have been seen to infer information about cases which have not been seen.
- Abduction reasons from a fact to the action or state that caused it.

2.2.5 Problem solving

Problem solving is the process of finding a solution to an unfamiliar situation, using the knowledge we have. There are different views on problem solving, some of them are:

- Gestalt theory: The Gestalt theory states that problem solving is both productive and reproductive; insight is needed to solve a problem. However, this theory has not been accepted as "sufficient".
- Divide and conquer: Breaking down a large, complex problem into smaller, solvable problems.
- Use of analogy: Problems are solved by mapping knowledge relating to a similar known domain to the new problem: analogical mapping.
- Hypothesis testing: Assuming a possible explanation to the problem and trying to prove (or, in some contexts, disprove) the assumption.
- Trial-and-error: Testing possible solutions until the right one is found.

2.2.6 Skill acquisition

Skill acquisition is achieved when an observed behaviour has changed due to experience or practice. This is known as learning and it is not directly observable. One model for understanding skill acquisition was proposed by Fitts (1954) and his colleagues and exposed the idea that learning was possible through the completion of various stages:

- Cognitive phase, where a skill is divided in parts trying to understand how do they work and act together.
- Associative phase involves individuals repeated practice until singular stimuli is recognized.
- Autonomous phase is perfecting skill acquisition gaining automation.

2.2.7 Errors and mental models

Changes in context of skilled behavior can cause errors. An incorrect understanding of a situation can cause errors because humans tend to create mental models based on experience.

These errors are mainly caused by the inherent difference in software developers who have different points of view about similar processes.

2.2.8 Emotion

Emotion includes both, physical and cognitive events. The body responds biologically to an external stimulus which is interpreted as a particular emotion. This biological response changes the way of dealing with different situations and this has an impact on the interaction with computer systems.

3 Key Concepts In Design

3.1 Usability

Usability is the pragmatic component of user experience, including effectiveness, efficiency, productivity, ease-of-use, learnability and retainability.

The main problems from the users point of view can be classified in:

- Fear, when the user is afraid of causing an unrecoverable state.
- Uncertainty, when the action does not have a clear result.
- Doubt is found when no solution seems to lead to the desired situation.

3.2 Functionality

Requirements and use cases are used to predefine this aspect, but what really defines the functionality is what can be achieved in the final product. If something does not work as intended or does not work at all is a functional problem.

The main keys in functionality:

- Working navigation.
- Fluid data input.
- Acceptable processing speed.

Major functionality problems are often found in applications like:

- Asking for non existent information.
- Non ability to resume work after a period of time.
- Loss of functionality over time.

3.3 Responsiveness

Signs, movements and sounds are usually used by humans to communicate effectively and to inform the other part of the communication that they have received and understood the data. Computers and devices are expected to include tools that allow users to verify that the orders given have been understood.

Responsive mechanisms must be appropriate, well-timed, understood and can be divided in these main groups:

- Acknowledge: Something that represents a receipt following a conscious action on the user. Apart from showing a message to the user, some other methods such as the followings can be applied:
  - Brighten and dim.
  - Zoom.
  - Sounds.
  - Movement.
- Transitional: Is the response to an unconscious interaction, for example hovering a link.
- Invitational: Is a signal attracting the user to perfom an action.

Apart from providing feedback, caused by the existence of a vast quantity of devices, responsiveness is also responsible for adjusting information depending on the type of device on which the information will be displayed.

3.4 Convenience

Convenience is the feature of placing the content where it is needed and providing the feeling of achieving the final objective.

If the user is requested to take actions with futile effect over the end result, frustration may appear. The main reasons for frustration can be:

- Interface switching.
- Unnecessary waiting.
- Overlapping.

3.5 Fail proof

Anticipating the questions people might have or answering questions the users did not think to ask might prevent failures and the following techniques are used in order to avoid them:

- Reminding: Pointing out that people may have inadvertently forgotten to do something, such as saving a document before closing it or attaching a file to an e-mail.
- Alerting: Flagging and tagging orders that specifically need to be done before the user can move on, such as filling in a password.
- Forcing: Eliminating options that are not available, such as graying out menu items that cannot be used or are not appropriate at some particular time.

If something goes wrong, the user should be able to know why did a message appear, understand it, receive helpful information and know the consequences.

3.6 Visibility

Being present in the screen is not enough for visibility as the user has to recognize the object and its functionality. Even if it is placed in plain sight, the user might think it does not exist.

Visibility is closely related to responsiveness as the dimensions of the devices nowadays con vary greatly. If all the content does not fit in the current visible space, it will have to be placed outside. This problem can be mitigated with the use of scrollbars and other indicators as leaving content slightly visible.

When placing content out of the user's field of view, the design has to inform precisely whether there has been a change that is invisible. For example in a long form, if there is a problem in a field outside the window, it should be placed in the middle so the user can know where the problem is.

Recognition has an important role in the visibility. Some problems can appear when trying to bring attention to something important. For example, Banners in webpages have created an ignore response from a lot of users and nowadays if colors and movements are used to inform that something is important, the user might not notice it and it becomes "invisible".

3.7 Logic

Logic is the process where users apply things they have learned in one situation to a new, but similar, situation somewhere else. Supporting the mental model of the user means that they can apply the knowledge they have achieved to provide a better user experience, but once this model is broken, the user starts to feel uncertain of their actions or fears making new decisions.

3.8 Consistency

Consistency is the use of an arbitrary rule all through the design. This rules apply to language, form, color and behaviour of every part of the design. Some rules have been already established in some environments such us shortcuts, visual effects and colors and even if a new and better rule can be applied, it can cause a bad user experience.

Some of the bad practices to be avoided are:

- Breaking the standards without any benefit for the user.
- Using different words for the same meaning in the same context.
- If users have to decide between options, they should be straightforward and without overlapping.
- Using the same icon for different meanings.
- Using a button for more than one function.

3.9 Predictable

Predictability stands for behaving the way the users expect. User needs can be supplied through shared references, which means that the designer and the user share the same basic understanding.

Between the many ways to improve predictability the designer can try to:

- Let the user know what to expect before they are executing an action.
- Let the users know what is expected from them.
- Show the number of stages in a long process.
- Make the user acknowledge the outcome of the process they are involved.
- Avoid invisible conditions or warn the user that they exist.

4 Process

4.1 Introduction

A process is a guiding structure which helps designers with the complex details of a project, it also acts as a checklist for experts to make sure they do not miss any important aspect of the problem to improve productivity. A process also provides a repeatable formula where past experiences can be helpful for the evolution of the project and can avoid pitfalls and minimize risk when externalizing a task thank you to the definition of what is expected from the other part and what information they need.

An iterative, evaluation-centered lifecycle compound of Analyze, Design, Implement, and Evaluate is vastly used among the interaction design world. Is in these activities where all the work products are created, including versions of the product or system being developed.

Figure 1: Evaluation Process

The evaluation activity shown in the figure includes both, rigorous and rapid evaluation methods for refining interaction designs. Beyond that evaluation activity, the entire lifecycle's evaluation is developed around the results of nearly every activity in the process which are evaluated in some way, by testing, inspecting, analyzing, and taking it back to the customers and users.

This process does not have to be a rigid path where every step is done thoroughly, some of the stages or sub-activities can be done swiftly or can even be skipped.

Based on:

- The Waterfall (Royce, 1970) software engineering lifecycle
- The Spiral Model (Boehm, 1988) of software engineering
- Mayhew's usability engineering lifecycle (Mayhew, 1999b)
- The Star lifecycle of usability engineering (Hartson '—&' Hix, 1989)
- The Wheel (Helms et al., 2006) lifecycle concept
- The LUCID framework of interaction design (Kreitzberg, 2008)

4.2 Analysis

Contextual inquiry and contextual analysis for studying customer and user work practice in situ are found among many possible sub-activities to support analysis. User needs can be inferred for a new system design by using these methods.

Extracting requirements from contextual data is another analysis sub-activity. The requirements are inputs driving the design process and helping to determine its features and the look, feel, and behavior of the interaction design. These requirements are used as a checklist to ensure that they are covered in the design, even before any user experience evaluation.

4.2.1 Contextual Inquiry

Contextual inquiry is gathering detailed descriptions of customer or user work practice with the aim of understanding work activities and underlying rationale through interviews of customers and users and observations of work practice occurring in its real-world context.

Collecting data in the work domain is not about requirements in the traditional sense but understanding user's work in context and trying to discover what it would take in a system design to support and improve the user's work practice and work effectiveness.

It is not easy for users to describe consciously what they do, specially in a project which has been internalized. It is also important not to narrow the design to a subset of users or activities but the whole spectrum.

"Contextual inquiry in human-computer interaction comes from ethnography, a branch of anthropology focused on the study and systematic description of different human cultures." Simonsen and Kensing (1997)

4.2.2 User Research

A persona is not an actual user, but a pretend user or a "hypothetical archetype" (Cooper, 2004). A persona represents a specific person in a precise work role with specific user class characteristics. Built up from contextual data, a persona is a story and description of a specific individual who has a name, a life, and a personality.

Personas have to provide enough information to draw people in and make them relate to the person they are reading about on the page. To help understand how the persona behaves and thinks, the following information is essential:

Photo

A photo is the first step to put a face to the persona. Photos that appear to be posed do not have the same effect as those that are in more natural settings. Personas seem to be more effective with photos taken in more natural settings.

Name

The photo you use will humanize the mix of research data and personality traits, and the name will be how everyone refers to your persona during discussions. A name provides the designers an easy way to speak about a user instead of trying to reference a user by their group or other characteristics. Avoiding similar names or known people's names is encouraged not to hurt feeling and avoid confusions.

Age

Even if the research is done in age groups, providing a specific age for the persona helps to add authenticity to the biography.

Location

As cultural and behavioral shifts can occur from location to location, placing the different personas in specific locations make the designer think about these differences.

Occupation

Occupation provides vital information such as the patterns of their day-to-day lives, their interaction with other people, endurance or management qualities.

Biography

The biography is the information that tells the story of a single persona making it more real and easier to feel empathy. This data does not have to be quotes but anecdotes, observations and data masked in a compelling manner to which the designers can relate to.

Different projects may require different sets of information about the personas to describe the target users, this is why the following information may be included in the description:

Education

Knowing how a person has been educated can provide some insight about their habits. Purchasing habits, brand perceptions, concentration levels and mental models differ between the different education levels.

Hobbies
Additional information about what the life of the persona is and what they like.

Technical comfort
Computers and electronic devices are used for everything and some of them can feel confused or out of place. These notion is important when a new product is going to replace a more traditional alternative.

Motivation
The reason why somebody wants to use something can help the designer to focus the goal of a project.

User goals
Identifying what the persona is hoping to accomplish can help provide insights into the persona's drivers for using it.

4.2.3 Contextual Analysis

4.2.4 Interaction Design Requirements

The output of contextual inquiry and analysis is not translated directly to what is needed as inputs to design as the information from contextual studies, they describe the work domain but do not meet the information need in design. If these differences can be suppressed, the designers will be able to change from studying an existing work practice to envision the new work space.

Interaction design requirements are needed to support the user's work activity and are usually connected to functional requirements to ensure the usefulness of the user experience.

On one hand, in previous software engineering traditions, a formal written requirements document was the most important and could even describe details about how the corresponding software had to be implemented, including object models, pseudo-code, use cases, and software structure. On the other hand, nowadays in software engineering and software requirements engineering, there is a new idea supporting that requirements cannot always be complete, fully correct and cannot be prevented from changing through the time. Even if interaction requirements are not the same as software requirements, it is important to have this limitations in mind.

Pulling out requirements from the previous stage is a deductive thinking process. It is deductive because each work activity note is treated as the major premise and the second premise is all the knowledge that the designer has about user experience and interaction design. The conclusion is a statement of user's needs and requirements deduced from the work activity note, something captured in a requirement statement.

Every work activity can generate:

- One or more interaction requirements.
- A functional requirement, that is out of the scope of the interaction design activity but is important to capture and share with the software development requirements.
- Nothing, as this activity could be considered irrelevant in the envisioned system.
- Questions about missing data.
- Marketing inputs. Captured comments and thoughts can be used to make marketing analysis and discover new opportunities.

The information captured in a requirement may contain category, title, description priority and traceability.

Category
Having a category is important to allow the gathering of different needs under the same scope.

Title
The title is a short description of the requirement.

Description
Details of the requirement are explained in the description. Some examples may be included in case of possible confusion.

Priority
The priority of a requirement is used to solve conflicts and focus on the important parts of the project.

Traceability

It is important to know why a requirement has been generated, the process is iterative and nothing is considered definitive. If any functionality or activity is modified in the future is important to review all requirements generated from it. The traceability could consist of a code that points to a work activity or another requirement.

Constraints, such as from legacy systems, implementation platforms, system architecture, cost, schedule and profitability, are a type of requirements in real-world development projects. Although most of the interaction design should be done independently from concerns about software design and implementation, it must eventually be considered as an input to software requirements and design.

Before starting with the design, the requirements should be validated by the owners of the project, as this is the step just before entering the design phase. Representative users can walk though the collected requirements making sure that the interpretation of the data is correct and providing feedback.

4.3 Design

4.3.1 Design Thinking

Design-thinking is an approach to creating an experience that includes emotional impact, appearance and oriented interaction. In a design-driven process, the design of the product concept and design for emotional impact and the user experience come first.

Design thinking can be approached through three different perspectives:

- Ecological Perspective, where integrating the system with its external environment and how the product is used in it's context is the main goal.
- Interaction Perspective where users look at displays and manipulate controls, doing sensory, cognitive, and physical actions in order to achieve a task.
- Emotional Perspective concerns social and cultural implications, as well as the aesthetics and joy of use.

4.3.2 Conceptual Design

The conceptual design is the manifestation of the designers' mental model within the system.

One way to start formulating a conceptual design is using metaphors or analogies in order to understand unfamiliar situations by using familiar conventional knowledge. This familiarity becomes the foundation underlying the rest of the interaction design.

What users already know about an existing system or phenomena can be adapted in learning how to use a new system

4.3.3 Design Production

Design production is an iterative process by itself, where multiple design concepts are compared in terms of experience and feasibility.

The type of prototype evolves with each successive iteration, roughly from paper prototype to low-fidelity wireframes and storyboards.

4.4 Evaluation

User experience is not directly measurable but some indicators can be extracted from experiments that will guide the way to improvements.

Indicators such as time to task completion or error counts, provide information to the designers which can be used in order to improve specific tasks.

Questionaries can also provide indicators of users satisfaction answering the questions closely related to emotional feelings.

It is important to notice that is not users evaluation, it is an aplication evaluation.

5 ESEM 2014 Conference Companion

ESEM, the International Symposium on Empirical Software Engineering and Measurement, is the principal empirical software engineering and measurement conference.

The goal of the International Symposium on Empirical Software Engineering and Measurement (ESEM) is to provide a forum where researchers, practitioners, and educators can report and discuss the most recent research results, innovations, trends, experiences, and concerns in the field of empirical software engineering and metrics.

This conference encourages the exchange of ideas which help explore, understand, and model phenomena in software engineering from an empirical viewpoint. The conference focuses on the processes, design and structure of empirical studies, and the results of specific studies.

Studies may differ from controlled experiments to field studies and from quantitative to qualitative studies.

5.1 Introduction

During a professional conference or symposium like ESEM, an attendee can expect to do a lot of walking around, meeting and greeting, professional networking and intensive learning. Unfortunately, the attendee can also expect to be saddled with a lot of paper: venue maps, agendas, speaker bios, training manuals and product information.

The events industry has been working towards the goal of 'green meetings' that manage with little or no printed collateral information for participants. Unfortunately, getting an ubiquitous, easy-to-use and relatively cheap solution for this challenge has been proved to be elusive.

Deployed on every mobile system, the conference app is installed quickly from the pertinent software store and then performs a full data download over Wi-Fi to fill in all the necessary content: agendas, exhibitors, maps, product details and attendee contact/social networking capabilities.

Using the app, attendees can manage their personal schedules versus the overall meeting agenda, keep track of contacts and vendors, and most important, they can get all their collateral and media in one place. This, reduces drastically the 'paper load' for the conference as a whole. Since the full dataset is resident on the device, most features will work without connectivity on-site (although audience response and social networking will take advantage of venue Wi-Fi where possible). Whenever the app is launched with network connectivity, it will check whether it has the most up-to-date content, speaker collateral and event schedule. If it is not updated, it only downloads the new or revised items to save bandwidth and time.

Apart from the attendees experience, a backend has to be designed to manage all the content and the process for the conference and some other tasks such as registering the speakers and their papers, configuring the schedules for the main event and its sub-events. This data has to be stored and has to expose an API so the mobile client can use it.

5.2 Main Objectives

5.2.1 Attendees

Attendees receive extensive schedules with a fully integrated interactive personal schedule builder for an attendee's pre-show planning and exhibitor selection.

- Session abstracts.
- Speaker bios and photos.
- Presentation slides and handouts.
- Floor plans.
- Social networking.
- Conference updates.

Before, during and after, attendees become part of a community with information and networking facilities. Attendees will experience services that are better organized, more up to date and easier to find.

5.2.2 Speakers

The ability to electronically distribute to all handled devices, last minute changes on their presentation within minutes of submission is a big feature that is not usually available.

Other speakers, attendees and show organizers can send messages throughout the conference without giving out each others permanent email addresses.

Sessions can have PPT, video, PDF, Word, eXcel attachments that the user will be able to open on the device.

5.2.3 Conference Planners

Estimate literature demand, preprint with extras, ship, store, deliver to the show floor, and clean up the leftovers. All that paper becomes obsolete by handing out a small electronic device that attendees will continue to use and appreciate long after the show.

Some advantages are:

- Flexibility to communicate changes and additional information throughout the meeting.
- Real-time on-site updates of information that used to be committed to paper weeks or even months in advance.
- Schedules, publications, presentation slides, videos, technical papers, product brochures, exhibition listings, maps, and all other content can be updated on the fly during the event.

The meeting is no longer a way to deliver knowledge and wisdom at a single point in time. Content updates and social networking of attendees continue throughout the year to create a community.

5.3 Analysis

5.3.1 Schedule

Depending on an attendee's needs, there are two different ways to explore the schedule:

- Schedule browser allows categorized display of sessions, with the ability to display by day, and the ability to search for sessions.
- Personal Schedule screen displays the sessions, posters and exhibitors the user has selected, with option to view all items or only sessions for the current day.

All schedule information should be stored on the device, but kept up-to-date, so that users can work without network access.

Schedule Browser
The schedule browser is the best way to plan out the conference in advance, to browse sessions and to look for sessions and papers.

The schedule can be arranged into logical groupings and sub-groupings as desired. The conference staff will be able to specify the groupings and sub-groupings so that all program info is organized as attendees expect it.

The schedule can be browsed as a whole, or the attendee can restrict browsing to a single sub-event at a time. Category and keyword searching allows the attendee to find out specific session.

Sessions are displayed in a convenient full-screen display, with description, speakers, time, date, room and other information. From the session, the user can touch a button to see the appropriate map highlighting the room where it is going to be held. Another button allows the session to be added to the personal schedule. The attendee can also touch the name of any speaker or presenter to know more about their bio or other sessions that the speaker is presenting.

Personal Schedule
The personal schedule provides attendees with a view of their personal schedule of activities, including any session that has been selected as favorite. The attendee is free to mark any sessions of interest for their personal schedule.

The personal schedule can be viewed for the whole duration of the meeting and can be a powerful assistant to the busy attendee by guiding them directly to where they want to go and reminding them of interesting activities. Integrating unscheduled items like exhibitor booths and posters can increase the visibility of other aspects of the meeting.

5.3.2 Speaker Information

The speakers and investigators are the most important people in the conference and as such, a listing should be provided for the user. Filtered by name or organization the attendee can find any speaker and access their information.

The information displayed for every speaker includes from personal information as name and biography to the pure academic as the sessions in which he or she participates and the organization that he or she is representing.

Email and other contact forms may be included so questions and meetings can be arranged in an easy way.

5.3.3 News System

Authorized conference staff are able to send messages to the entire attendee list using a web form. This mass-messaging feature can make it easy to update attendees on conference news and changes to the program, to highlight special events and also to deliver suitable marketing messages. Messages sent by the conference to attendees can include a banner ad that can link to an advertiser's provided information, similar to ad banners placed in other areas of the app. This allows messages to be "sponsored" by an advertiser or exhibitor.

5.3.4 Maps

Maps of the conference centre facilities, and other locations such as hotels where scheduled events may occur can be accessed from the app. Even maps of the streets surrounding the conference can be included as desired. The map display will allow the user to pan and zoom the map using mobile devices intuitive features.

Most features link to a specific room or area on a given map that is highlighted. Since the maps are stored on the handheld device they continue to be available wherever the attendee goes.

5.3.5 Local Information

The paper-based attendee package of previous years probably contained many different types of non-program information, all of which will improve the experience of conference attendees and facilitate taking full advantage of the conference.

Information about conference center facilities, travel information, shuttle schedules, food service, local restaurants, and information about your association, group or industry may be included too.

The system groups conference information is shown in a hierarchical design that allows attendees to easily find the desired information. At each level of the hierarchy, additional sub-categories can appear beside documents that may be accessed directly. Once selected, documents can display information in graphical, textual, PDF or video based formats, as appropriate.

5.4 Requirements

5.4.1 Functional Requirements

1.001 User Roles

The system should allow authorized users based in roles to:

- Provide security for different levels of role.
- Define security at the function level.
- Limit access to one or more specific fields within the system.
- Limit access to a specific record or group of records within the system.

1.002 Event Admin

The Event Admin is a role that allows:

- Managing Event.
- Creating Event Admin users.
- Configuring the notification system.
- Modifying the web content of the Conference Front-end.
- Creating Subevents.
- Creating Sub-event Admin
- Sending user notifications.
- Managing Locations.
- Setting Locations to sub-events.
- Managing Event Front-end.

1.003 Sub-event Admin

The Sub-event Admin is a role that allows:

- Managing Subevent.
- Managing Speakers.
- Managing Papers.

- Managing Sessions.
- Assigning Papers to Sessions.
- Organizing Program.
- Managing Sub-event Front-end.

1.004 Event Front-end
The Event Front-end is an HTML website that shows information like the conference schedule, venue, hotels, sponsors, links and other information. It contains links to the other Sub-events Front-end.

1.005 Sub-event Front-end
The Sub-event Front-end is an HTML website that shows some information about the Sub-event like the schedule, speakers and papers.

1.006 Manage Event
The user shall be able to modify all the fields and media related to the main event. The sub-events creation and Sub-event admin assignation is part of the event management.

1.007 Manage Sub-event
The user shall be able to modify all the fields and media related to the Sub-event.

1.008 Manage Sessions
The user shall be able to create, modify and delete the sessions that will be part of a Sub-event.

1.009 Manage Papers
The user shall be able to create, modify and delete the papers that will be part of a Sub-event.

1.010 Manage Speakers
The user shall be able to create, modify and delete the speakers that will be part of a Sub-event.

1.011 Organize Schedule

The schedule has to be divided in slots which will contain sessions with papers. This step has to be separated from the creation of the data as it may change before and during the conference.

1.012 Client API

The server exposes a JSON Application Programming Interface that allows the clients to retrieve all the information relative to the speakers, locations, schedule, session and paper contents.

1.013 API Versioning

As the data stored in the server can change through the time, a versioning is needed to detect variations and update accordingly on the different clients.

1.014 Dynamic Data Acquisition

The server should answer the clients only with the new or modified data to the clients so the minimal bandwidth is used.

1.015 Offline Data

The clients should store all the data needed to function properly the first time it is downloaded. Providing an offline schedule is one of the main features, as there will be many people without data-plan.

1.016 Schedule Browser

Users can browse the schedule organized by day and hour. Session, paper and speaker details can be accessed from the schedule browser.

1.017 Schedule Filter

The schedule can be filtered by Sub-events, providing a subevent focused experience.

1.018 Personal Schedule

A personal schedule can be composed with the favourite papers and sessions of the user.

1.019 Document Downloads

Each paper and session can contain documents that have to be downloaded separately.

1.020 Speakers Browser
A list with filters to browse all the speakers participating in the conference.

1.021 Room Location
Either by showing a map or using the GPS, the device should be able to give indications to locate the different emplacements of the conference.

1.022 Room Schedule
It shows all the sessions and papers that will be presented in a specific room so the attendees that are in a room can easily see what will be presented in the following span of time.

1.023 Background Notifications
All the client devices should listen to news coming from the server and notify the user even if they are not interacting with the application.

5.4.2 Interaction Requirements

Interaction requirements are the behavioral properties that the specified functions must have, such as performance or usability.

3.001 Schedule Composition
A drag-and-drop interface containing the schedule and all the sessions and papers should be provided to the managers so they can generate and visualize the final schedule intuitively.

3.002 Automatic transparent update
Data updates should be done fastly and transparently without the user noticing it.

3.003 Schedule Positioning
During the days of the conference, when the user opens the application, it should automatically be positioned in the current day and time so it is easier to decide what to do.

3.004 Schedule Comparison
While navigating the main schedule it would be a good feature to be able to see the empty slots in the personal schedule so the attendee can add sessions to attend the maximum number of presentations.

3.005 Session Grouping

Having different Sub-events with its own schedule will lead to parallel presentations. It is important to present this information to the user so he can decide what presentation to attend.

3.006 Fast Content Access

Whenever the name of a session, speaker or location appears in the screen of the user, clicking on it should redirect the user to the details of that content. This avoids the need to go to the menu and search for something.

3.007 Unique Document Download

The papers can be downloaded by the user anytime, but as this can cost money or consume time this operation should be done just one time for each document. In case the document is updated server-side it should be downloaded again.

3.008 Multi-Platform

The application should be executable from the main mobile operating systems. Android, iOS and Windows Phone are the most used platforms nowadays.

3.009 Responsive

Due to the different device screensize, pixel density and form, the applications should be responsive and adapted to be used on smartphones and tablets.

5.5 Personas

5.5.1 Giorgio

Name
Giorgio Porto Cappelletti

Age
52

Location
Verona

Occupation
Own-employed in a little company

Biography
Giorgio was born in a little town near Torino. Studied Computer Engineering at Politecnico di Torino (1980-1985). He is married and has 2 sons.

Education
Software Engineer

Hobbies
-Wine -Jogging -Sailing

Technical comfort
Medium

Motivation
Learn new things to apply on his own enterprise

User goals
Learn new techniques to make products better

5.5.2 Jaqueline

Name
Jaqueline Mestre Laso

Age
28

Location
Torino

Occupation
Developer in a mobile software company.

Biography
Jaqueline studied at Politecnico di Torino and graduated 2 years ago. She has been working in University Department since then.

Education
Software Engineer

Hobbies
-Traveling -Robotics -Software Art

Technical comfort
High

Motivation
Meet new people and have her scheduled organized is the main motivation to use the app.

User goals
Attend the conference to gather some information for a Paper she is writting.

5.5.3 Qwaiv

Name
Qwaiv Mehra Rangarajan

Age
34

Location
New Delhi

Occupation
Works in a company as Testing Engineer

Biography
Qwaiv was born and educated in New Delhi, funded his own enterprise at age 20 and sold it to the actual company were he works now.

Education
Telecomunications Engineer

Hobbies
-Electronics -Reading -Cricket

Technical comfort
High

Motivation
Does not know anything about Torino and would like to have an offline guide to visit the city and

User goals
Meet new people and travel while learning.

5.6 Design Iterations

5.6.1 Iteration 1

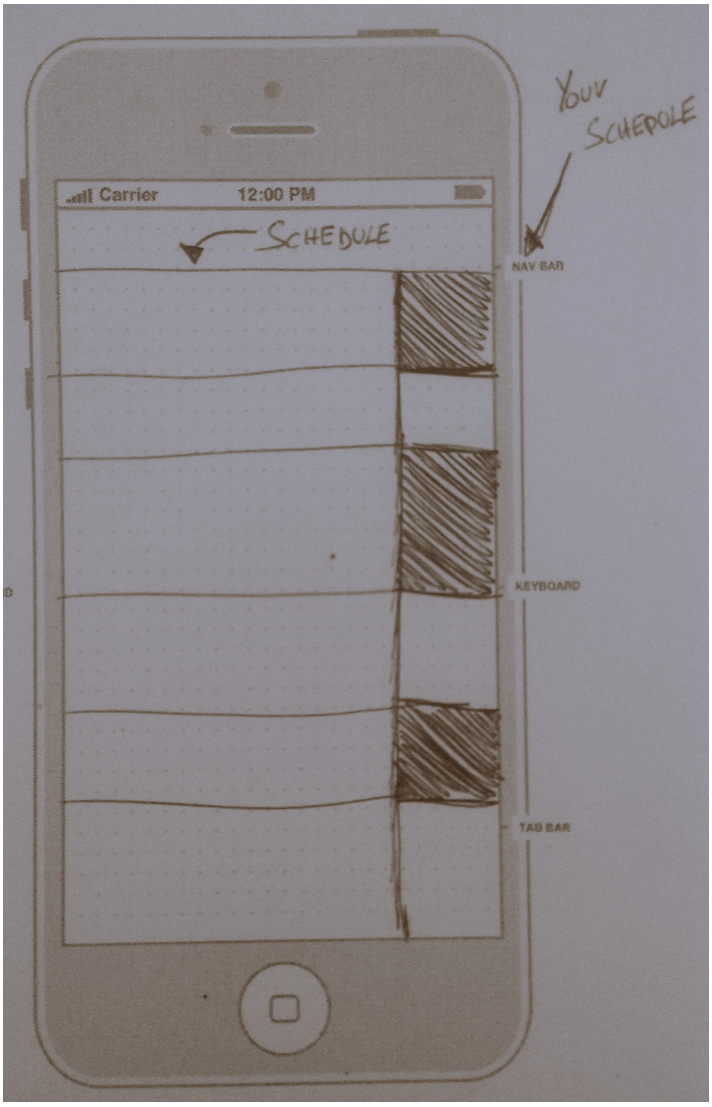

Figure 2: Schedule

The first sketches were to start iterating for the most important parts of the application like the presentation of the Schedule. A vertical view of the different sessions with a lateral indicator to be able to know if that slot was allready taken in the personal scheduled is presented.

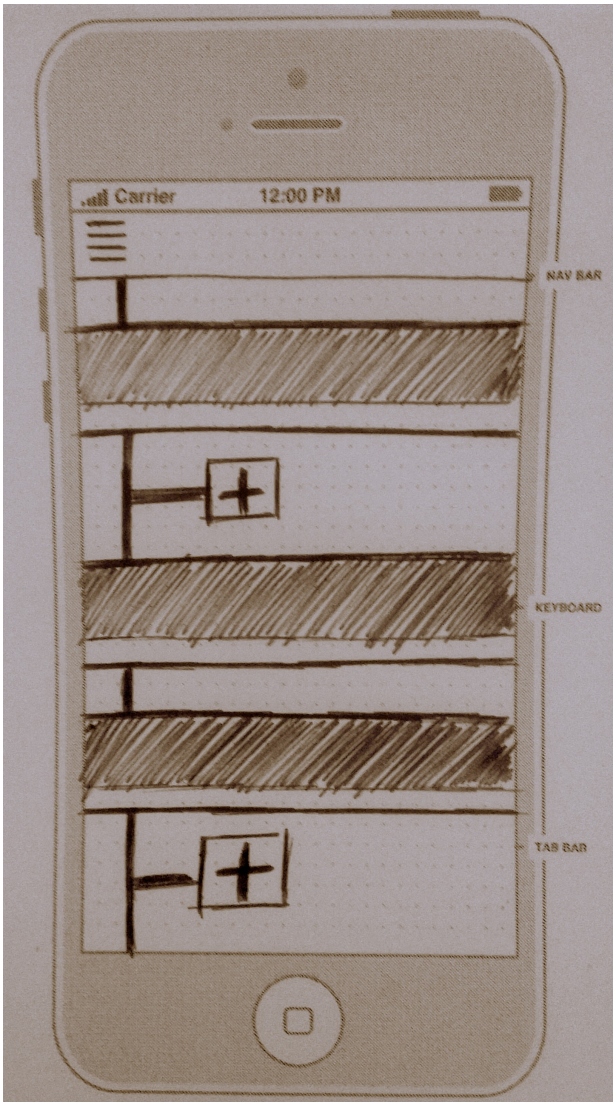

Figure 3: My Schedule

The personal schedule was initially sketched as a timeline presenting the sessions that the user had selected as favourites and some empty spaces that would allow the user to add sessions that fitted those spaces.

5.6.2 Iteration 2

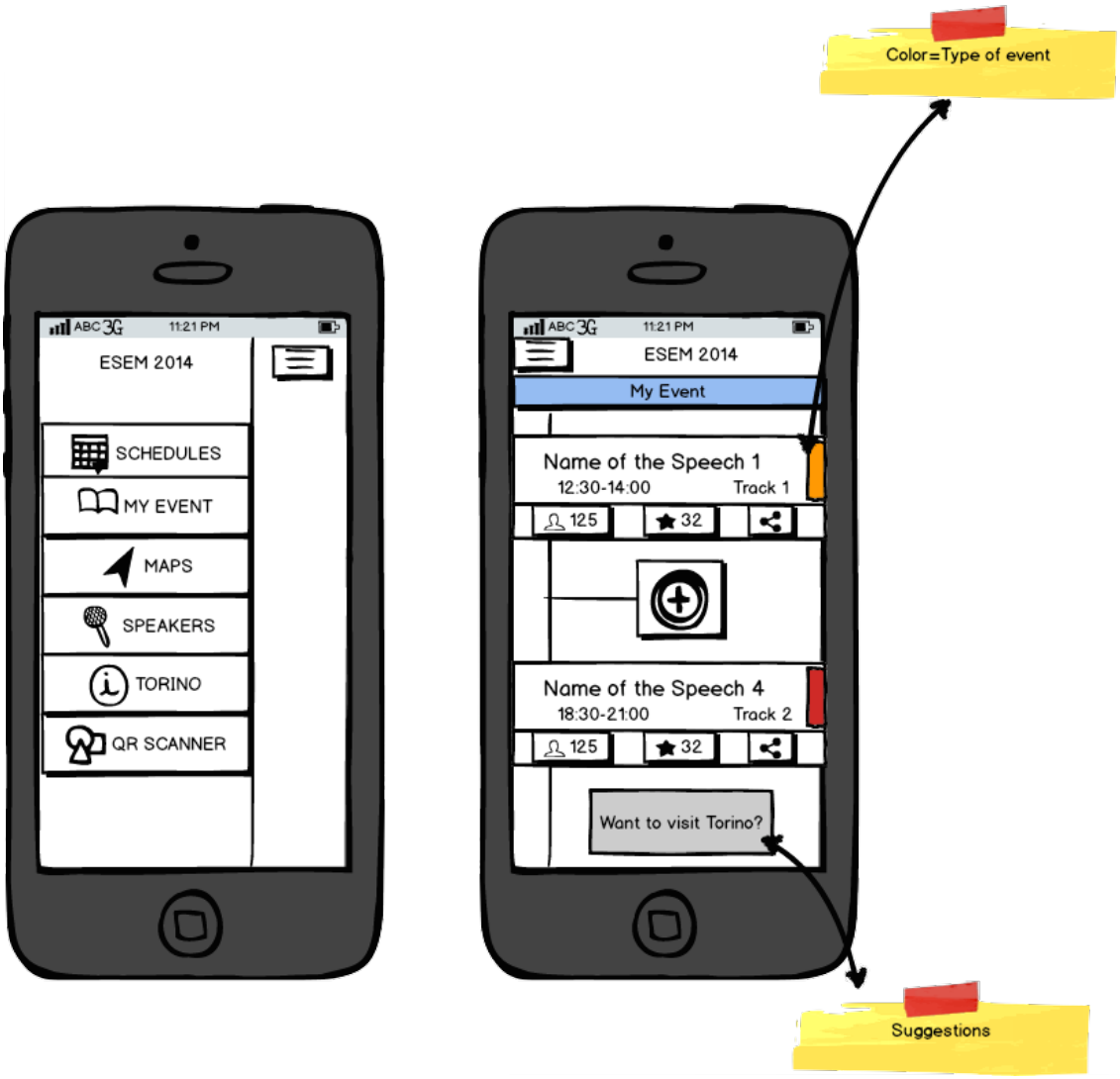

Figure 4: Lateral menu and Personal Schedule

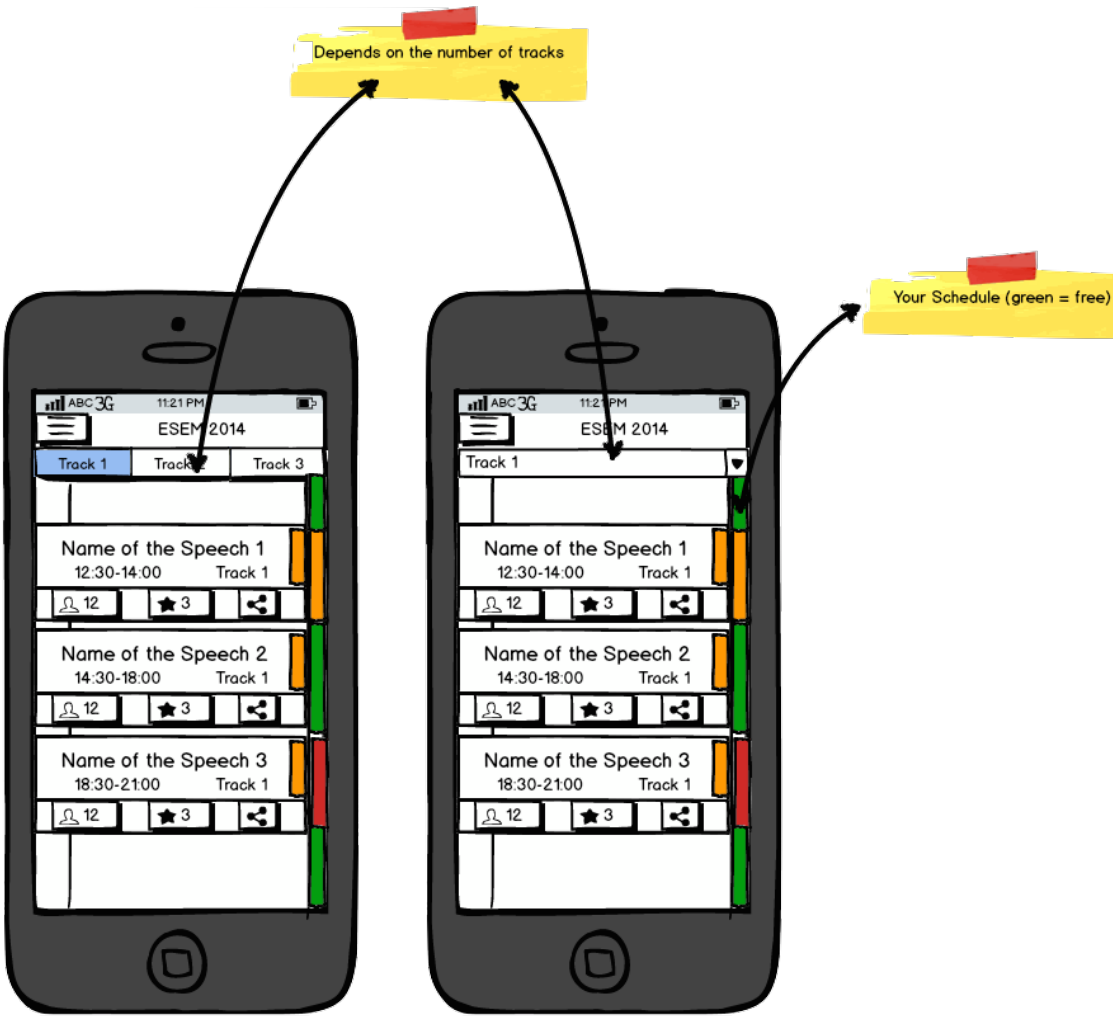

Figure 5: Schedule Posibilities

5.6.3 Iteration 3

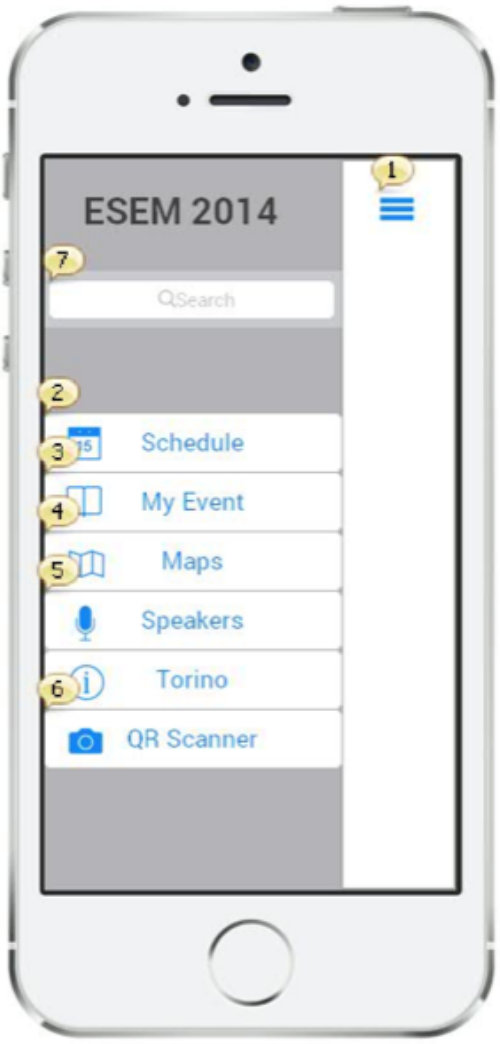

Figure 6: Lateral menu

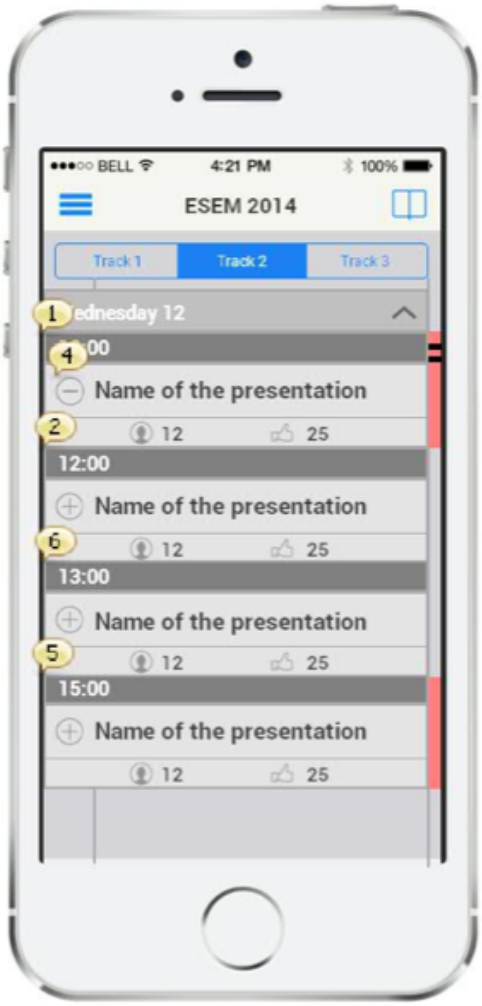

Figure 7: Schedule

Figure 8: Personal Schedule

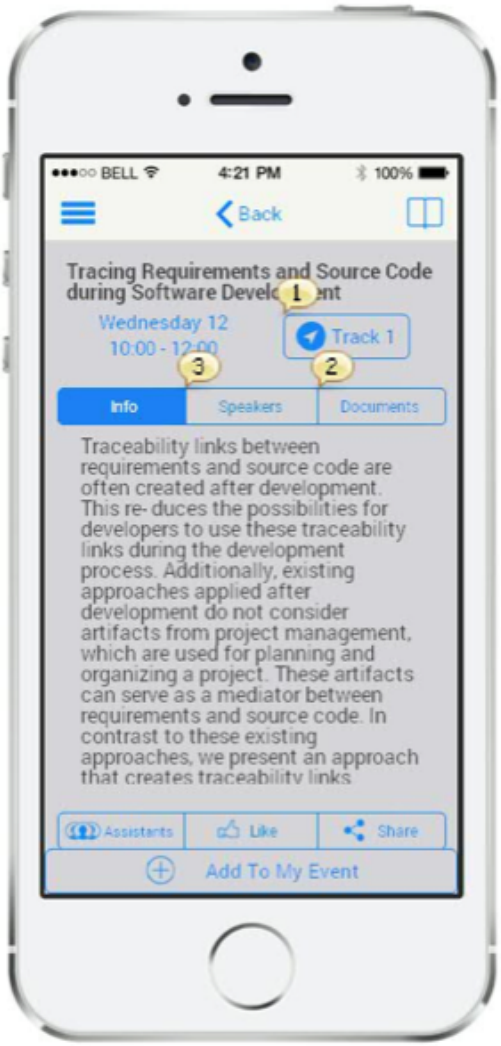

Figure 9: Presentation Information

Figure 10: Presentation Speakers

Figure 11: Presentation Documents

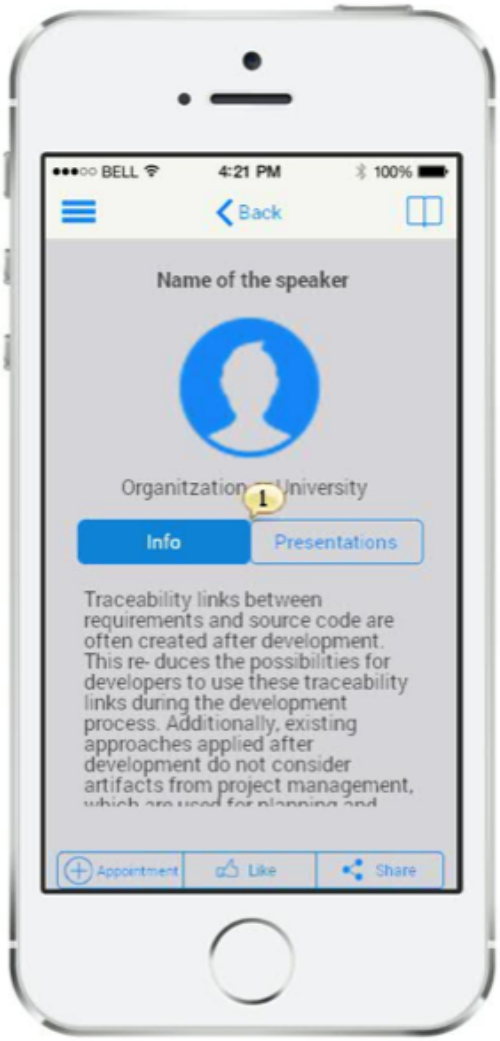

Figure 12: Speaker Detail

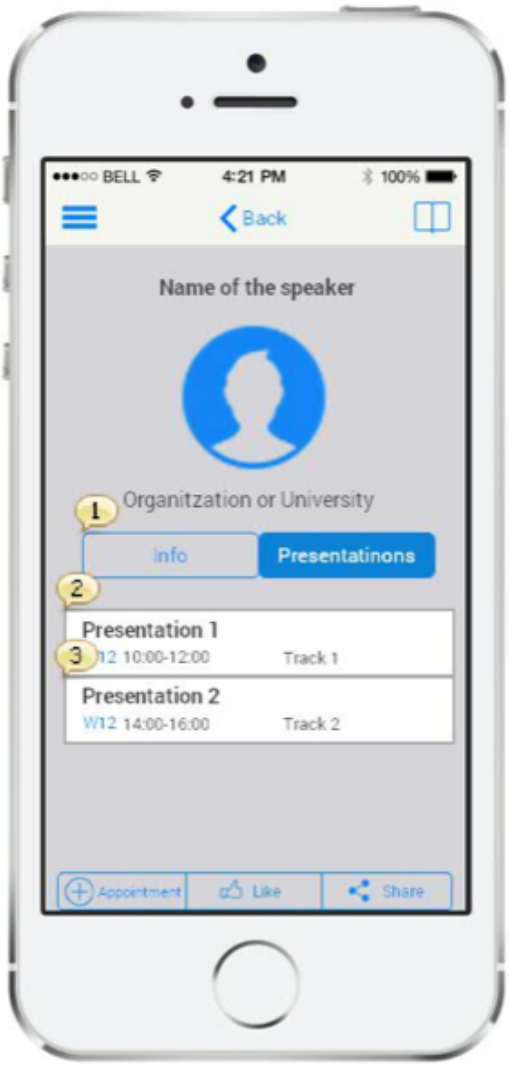

Figure 13: Speaker Detail

Figure 14: Speaker Search

Figure 15: Location Browser

5.6.4 Iteration 4

Figure 16: Location

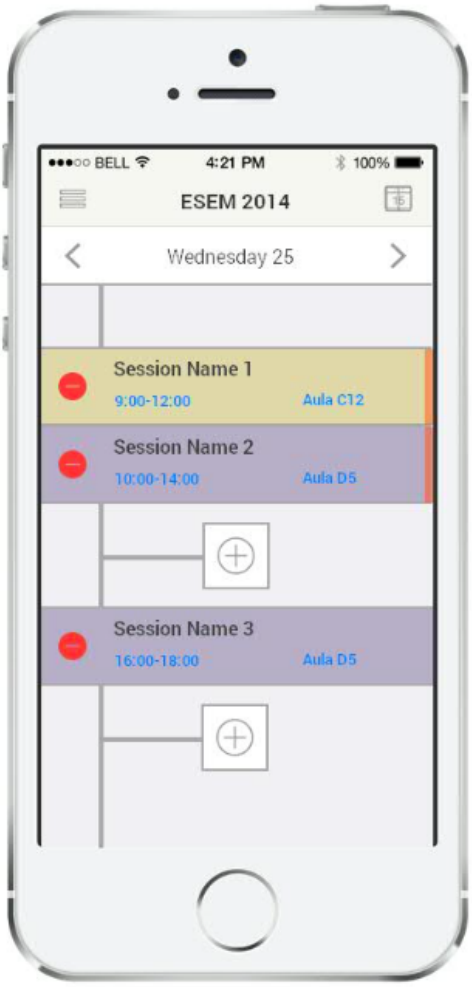

Figure 17: Personal Schedule

Figure 18: Presentation Information

Figure 19: Speaker Information

Figure 20: Speakers Search

5.6.5 Iteration 5

Figure 21: Lateral menu

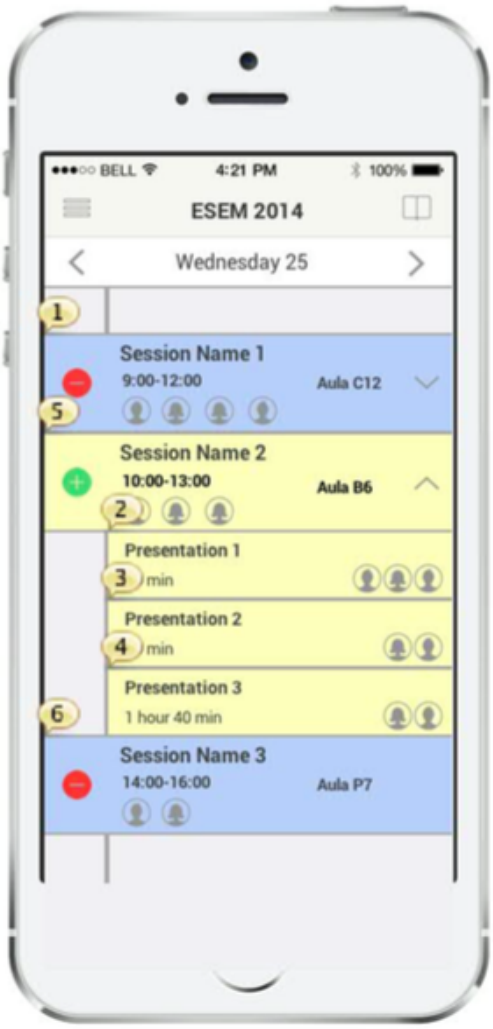

Figure 22: Schedule

Figure 23: Session Detail

Figure 24: Presentation Information

Figure 25: Speaker Information

Figure 26: Location

Figure 27: Personal Schedule

Figure 28: Speaker Search

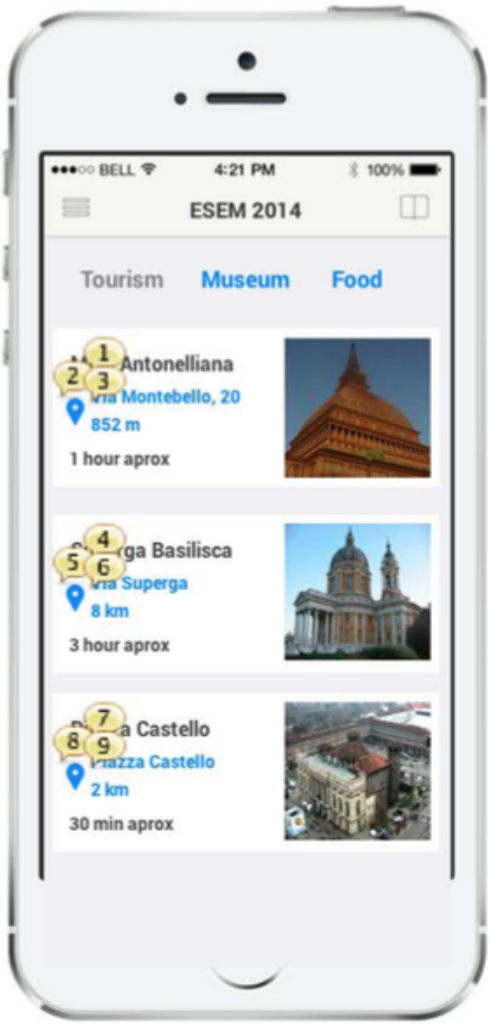

Figure 29: Location Search

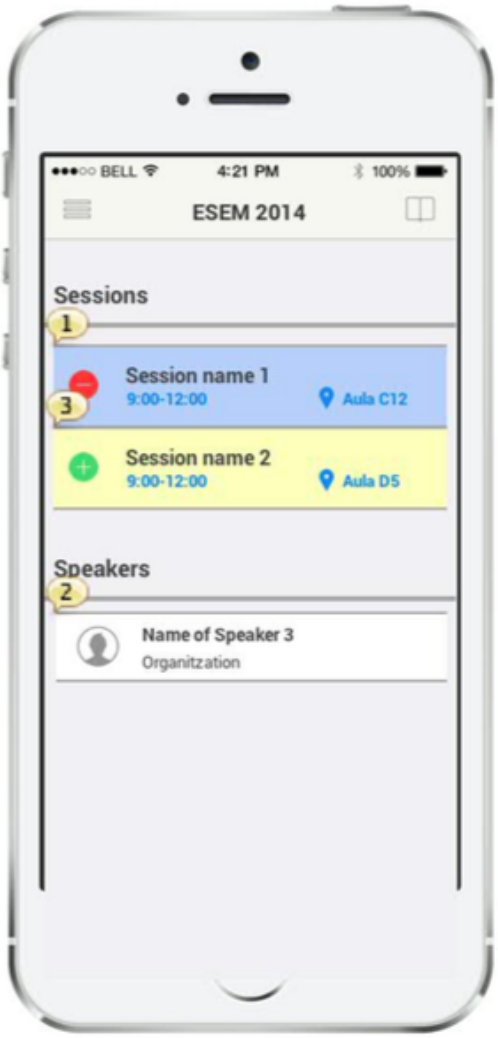

Figure 30: Favourites screen

Figure 31: Add appointment on specific timespan

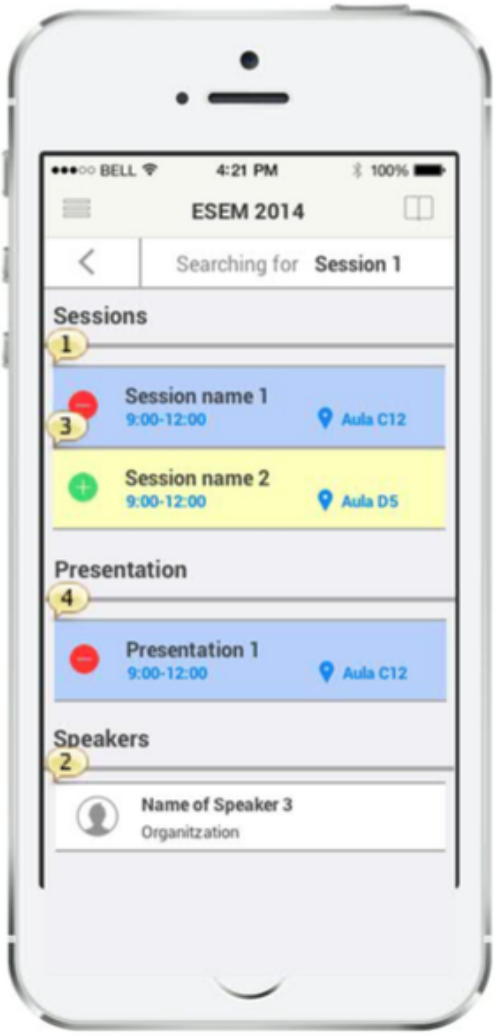

Figure 32: Search results screen

6 Usability tests and results

Ten different people were asked to perform tasks with the iterations 3, 5 and 6 of the designs in order to evaluate whether the design decisions have been taken correctly, four different test were done with similar devices and environment to the ones that would use the final user.

The designed tasks and its results are:

Add Specific Appointment

DESCRIPTION	TEST 1	TEST 2	TEST 3
User 1	36	22	10
User 2	22	21	11
User 3	36	23	20
User 4	47	12	10
User 5	23	32	11
User 6	24	19	14
User 7	26	25	9
User 8	26	25	9
User 9	27	19	8
User 10	43	35	16
TIME IN SECONDS UNTIL COMPLETION			

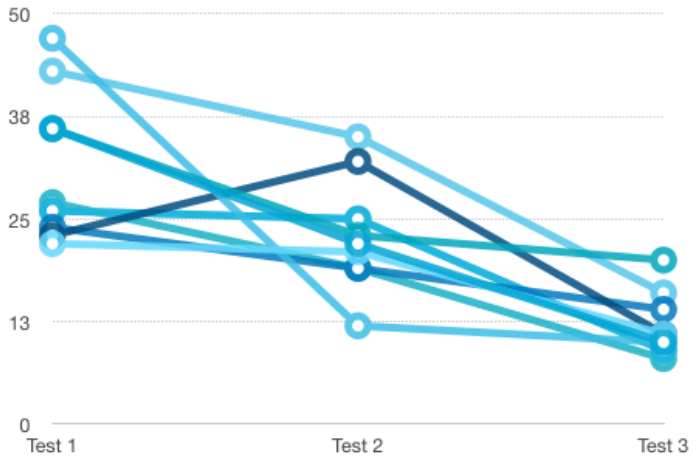

Figure 33: Add specific appointment test results

Adding an appointment to the personal agenda is one of the main functionality and it may be the most used. The results of this test has concluded as positive by seeing the decreasing times and low disparity of the results after only two tests.

View Planned Day

DESCRIPTION	TEST 1	TEST 2	TEST 3
User 1	10	9	10
User 2	11	9	13
User 3	8	10	9
User 4	10	11	11
User 5	13	9	10
User 6	9	7	10
User 7	7	14	9
User 8	9	10	12
User 9	10	6	10
User 10	12	10	8
TIME IN SECONDS UNTIL COMPLETION			

Figure 34: View planned day test results

Viewing a previous planned day in an ordered form is as important as adding new data to the calendar. Many ways of presenting this data were available and all of them had some issues but the last iteration provided users with a nice feedback on what was presented in the devices.

Download and Open Paper PDF

DESCRIPTION	TEST 1	TEST 2	TEST 3
User 1	30	29	24
User 2	34	34	28
User 3	31	38	23
User 4	33	29	26
User 5	30	31	27
User 6	31	31	25
User 7	29	26	28
User 8	31	28	32
User 9	32	27	23
User 10	29	26	23
TIME IN SECONDS UNTIL COMPLETION			

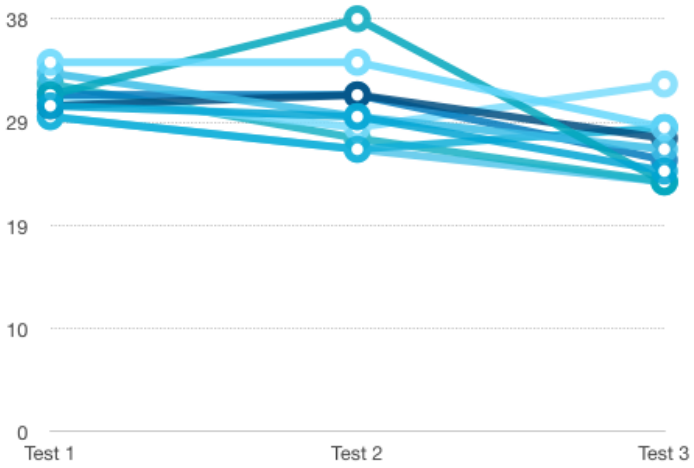

Figure 35: Download and open paper PDF test results

Simulating the download of a PDF was quite difficult but this was a complex task were finding the desired paper had to be done before being able to download and read the PDF.

Find Location And Start GPS

DESCRIPTION	TEST 1	TEST 2	TEST 3
User 1	30	28	26
User 2	35	29	24
User 3	31	34	33
User 4	30	30	26
User 5	27	30	25
User 6	34	33	28
User 7	30	23	25
User 8	29	29	27
User 9	29	26	30
User 10	39	29	25
TIME IN SECONDS UNTIL COMPLETION			

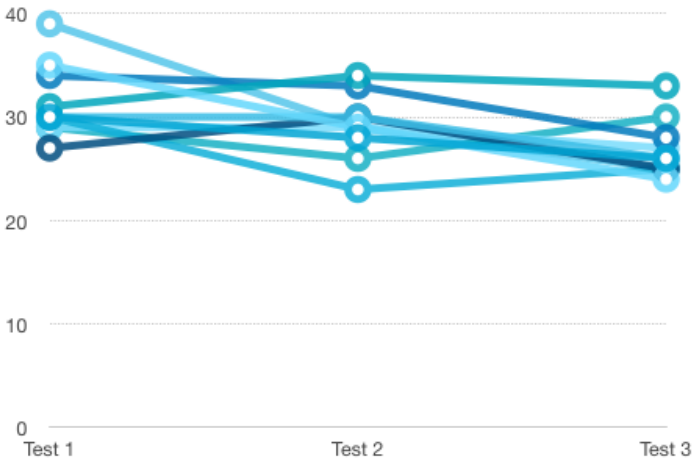

Figure 36: Find location and starts GPS test results

Searching for locations is not one the most important features of the software but testing it allows the final product to deliver a similar experience for all the different actions.

Even if no critical results can be taken from this tests, seeing how people interact with the software gave some basic ideas to continue improving the design.

7 Real World

Developing the same app for multiple mobile platforms, for example Android, iOS or others, can be a daunting task. Platforms are different in terms of hardware, software, users' expectations, and there is a variation of specifications even within platforms.

From the user's point of view, platforms may look similar, but they are not. Disregarding the branding on the outside; there are icons to tap on, and things to slide across the screen.

Platform guidelines should be treated as recommendations and as the starting point for a User Experience design process. There is a lot of work behind this documents and it could be dangerous not to follow them in terms of logic, consistency and predictability that the user has already acquired.

Exploring outside platform guides has proofed to be a valid option for many app developers. For example the "pull to refresh" by Twitter has proofed to be a really good solution to get the new data currently in the screen.

8 Conclusions

Although no single methodology allows experience design neither to be used to prevent problems nor to apply as a point solution to existing problems that can arise from shortsighted decision-making processes, introducing experience design once the project has started is much more difficult.

Technical difficulty does not usually limit the software quality, so many companies have been successful by just figuring out how to deliver the right value through products, services, solutions, and overall experience that meet their customers' needs. For example, lots of hosting companies have been in business for years but newer companies like Heroku, Linode o DigitalOcean have focused in providing the best experience for developers from the start.

Thinking about designing for user experience means exploring other perspectives of software development that will lead to a planification based on user goals, experiences, thoughts and expectations which will definitely change the final result for both, the enterprise and the user.

Design must revive maker attitude without losing formal systems when permitted by the situation in order to provide a functional, maintainable and usable software.

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